Introduction

In 1947, the Steelman report discussed the science and engineering (S&E) labor force in a chapter entitled "Manpower: The Limiting Resource," in which it stated that research and development (R&D) activities were limited by "the availability of trained personnel, rather than the amount of money available." It reported the pool of scientists and "research engineers" in the United States to be 137,000, of whom 25,000 had doctorates. In 1997, the National Science Foundation (NSF) estimated that there were 3.1 million workers in S&E occupations and a total of 10.1 million workers with S&E degrees.[1] In spite of these larger numbers of S&E workers, there is more of a debate today as to whether the size of the S&E workforce is a constraint on new knowledge, innovation, and technological advancement. It should be noted, however, that the vast majority of those with S&E degrees, particularly at the graduate level, are employed in jobs that are relevant to their degrees, and intensive technical knowledge finds uses in many places outside the laboratory.

This chapter first examines the major indicators and characteristics of the S&E labor force. Information on the sex and racial or ethnic composition of the S&E workforce is presented next, followed by a description of the labor market conditions for recent bachelor's, master's, and doctoral S&E degree recipients. A discussion of the impact of age and retirement on the S&E labor force is presented next. The chapter also provides data on the projected demand for S&E workers over the 1998–2008 decade. It concludes with a brief section on foreign-born scientists and engineers, and presents comparisons regarding international R&D employment.

Selected Characteristics of the S&E Workforce

The data in this section are from the NSF's Scientists and Engineers Statistical data system (SESTAT), which is a unified database primarily containing information on the employment, education, and demographic characteristics of individuals with S&E degrees in the United States. (See NSF 1999f.)[2,3]

How Large Is the U.S. S&E Workforce?

Estimates of the size of the U.S. S&E labor force can vary dramatically depending on what criteria are used to define a scientist or engineer. (See the sidebar, "Who Is a Scientist or Engineer?") Educational degree levels and fields, occupational categories, or a combination of these factors may all be taken into account.[4] In 1997, more than 12.5 million people in the United States either held degrees in science or engineering or were working as scientists or engineers. (See appendix table 3-1.) The number of individuals holding a college degree in an S&E field in 1997 exceeded by a large margin the number of persons working in an S&E occupation because many S&E degree holders were not working in an S&E field. Numerous individuals were also working in S&E occupations who were educated in fields not considered science or engineering related.

Basic Characteristics

Including those either with science or engineering degrees or in science or engineering occupations, approximately 12.5 million scientists and engineers were residing in the United States as of April 1997.[5] Only 84 percent (10.6 million) of these individuals, however, were in the workforce. (See appendix table 3-1.) The remainder were either unemployed, but seeking work (193,700), or were not in the labor force (1.75 million). Of the 10.6 million employed, the vast majority (10.1 million) held at least one college degree in a science or engineering field. About 30 percent (3.1 million) of the 10.1 million S&E degree holders in the workforce were also employed in S&E occupations. (See text table 3-1.)

Relationship Between Education and Occupation

Many of the Nation's scientists and engineers hold either multiple S&E degrees or have degrees in both S&E and non-S&E fields. Many S&E-educated workers also routinely find S&E-related employment in occupations not included in traditional S&E taxonomies. Of the 10.1 million S&E degree holders in the workforce in 1997, about three-fourths (7.7 million) reported that their highest degree was in an S&E field. (See appendix table 3-2.) Many of these individuals (4.9 million), however, were not principally employed in a traditional science or engineering occupation.

The likelihood of an S&E degree holder occupying an S&E job varies by field of degree. For example, about two-thirds (66 percent) of S&E degree holders whose highest degrees were in engineering fields were employed in an S&E job in

[1] Although this clearly shows great growth in science and engineering (S&E) education and employment, these numbers probably should not be used to estimate an exact 50-year growth rate. It is not immediately clear how the Steelman estimates were made, and the 1947 number may exclude many classes of workers included in the 1997 NSF estimate.

[2] Selected tables, copies of questionnaires, data quality control information, and the ability to perform simple tabulations from the public use version of SESTAT data are all available from <<http://sestat.nsf.gov>>.

[3] SESTAT data are collected from three component surveys sponsored by NSF and conducted periodically throughout each decade: (a) the National Survey of College Graduates, (b) the National Survey of Recent College Graduates, and (c) the Survey of Doctorate Recipients. SESTAT's target population is residents of the United States with a bachelor's degree or higher (in either an S&E or non-S&E field) who, as of the study's reference period, were:

•Noninstitutionalized,

•Not older than age 75, and

•Either degreed in science or engineering or working as a scientist or engineer—that is, either had at least one bachelor's or higher degree in an S&E field or had a bachelor's or higher degree in a non-S&E field and worked in an S&E occupation as of the reference week.

For the 1997 SESTAT, the reference period was the week of April 15, 1997.

[4] For a detailed discussion of the S&E degree fields and occupations in SESTAT, see NSF 1999a.

[5] This number includes all people who have ever received a bachelor's degree or higher in an S&E field, plus people holding a non-S&E bachelor's or higher degree who were employed in an S&E occupation during either the 1993, 1995, or 1997 SESTAT surveys.